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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/633,335	08/01/2003	Zvi Yaniv	12179-P116US	4189

26201 7590 06/06/2007

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EXAMINER	
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ART UNIT	PAPER NUMBER
1762	

MAIL DATE	DELIVERY MODE
06/06/2007	PAPER

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/633,335
Filing Date: August 01, 2003
Appellant(s): YANIV, ZVI

Kelly K. Kordzik
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed February 27, 2007 appealing from the Office action mailed September 11, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

20030013091	DIMITROV	1-2003
5,990,479	WEISS et al	11-1999
6,458,327	VOSSMEYER	10-2002
20020004246	DANIELS et al	1-2002

6,544,732	CHEE et al	4-2003
6,261,779	BARBERA-GUILLEM et al	7-2001
20040009911	HARRIS et al	1-2004
6,530,944	WEST et al	3-2003
6,908,737	RAVKIN et al	6-2005
6,778,165	HUBBY, JR. et al	8-2004
5,457,073	OUELLET	10-1995

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

The Examiner Note: in a process of forming a chemical adsorbate, physisorption of a chemical species onto the surface of nanoparticles is a first necessary step before being chemically adsorbed onto the surface of the nanoparticles.

Claims 1, 3, 5, 8, 15 are rejected under 35 U.S.C. 102(e) as being anticipated by Dimitrov (US 20030013091).

Dimitrov discloses a process or detection and quantification of analytes in complex mixtures comprising exposing a target analyte (claimed chemical species) to a <u>label</u> (See P10, P27, P28, P31, P32) in <u>**solution**</u> or <u>**solid-phase**</u>, e.g. to a solid surface such as a chip, microarray or bead (See P13) such that the target analyte binds, attaches (adsorbs) to the label as a chemical adsorbate (See P10, P12), and measuring a detectable signal, i.e. a <u>detectable, physical quantity or impulse</u> such as ***fluorescence***, luminescence, from the label (P21) using an analytical method (P20) by which information on the <u>**presence of an analyte can be determined**</u> (P22).

Measurement can be quantitative or qualitative (See P13). Dimitrov teaches that nanoparticles such as quantum dots (e.g. CdS) also can be used to label nucleic acids (P38). Quantum dots are ***fluorescing*** crystals that are excitable upon **irradiation** with *white* light (comprises claimed UV radiation) (P40) with a wavelength dependent on their chemical composition and size (P40).

In other words, Dimitrov teaches that the presence of an analyte can be determined by irradiating the nanoparticles comprising the chemical adsorbate with radiation; detecting altered photoluminescence properties of the nanoparticles comprising the chemical adsorbate (as a result of analyte being physically and chemically adsorbed); and d) analyzing the altered photoluminescence properties by comparing to one or more pre-defined altered as ***fluorescence*** properties **depending on their chemical composition** and size (i.e. not on *how* the analyte is associated with the nanoparticle by physical or chemical adsorptiom), to provide for an identifying of the chemical species (See P34, P38-40). Note that claim 1 does not recite a negative limitation of analyte not being chemically adsorbed.

Claims 1-5, 8, 10, 11, 14, 21, 22, 25, 26, 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weiss et al (US 5,990,479) in view of Dimitrov or Vossmeyer (US 6,458,327).

Weiss et al disclose a process comprising exposing a material comprising a detectable substance (claimed chemical species) to a an organo luminescent semiconductor probe comprising a semiconductor nanocrystal (claimed quantum dot) (See column 2, lines 54-67) such as silicon (See column 6, line 2) linked to an affinity molecule capable of bonding to the detectable substance and a process for using the probe to determine the presence of a detectable substance in a material (See column 2, lines 54-67; column 9, lines 37-56) using **UV light** (See column 9, line 1). Weiss et al teach that the organo luminescent semiconductor is capable of

exhibiting a detectable change in adsorption (See column 2, lines 24-25), i.e. the organo luminescent semiconductor of Weiss is capable of detecting altered photoluminescence properties of the nanoparticles comprising the chemical adsorbate as a result of the chemical species being adsorbed onto the surface of the nanoparticles, as required by Amendment. Weiss et al further teach that the adherence of a detectable substance to a nanocrystal may comprise **any** sort of bond, including, but not limited to, covalent, ionic, hydrogen bonding, **Van der Waals' forces (claimed physisorption)**, or **mechanical bonding (claimed physisorption)** (See column 5, lines 41-46).

Weiss et al do not expressly teach that an exposure of the detectable substance to the nanocrystal is carried out in a solid or gas phase (Claims 1, 21).

Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle, e.g. quantum dot, in a **solution** or **solid-phase**, including, for example, to a solid surface such as a chip, microarray or bead (See P13).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Weiss et al in a solid phase since Weiss et al do not limit the exposure to a particular phase and Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle in a solution or solid-phase.

Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a **liquid** or **gas-phase** (See Abstract; column 5, lines 34-45).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Weiss et al in a gas phase since Weiss et al do not limit the exposure to a particular phase and Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a liquid or gas-phase.

Claims 1-5, 8, 12, 15, 21, 22, 27, 29, 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Daniels et al (US 20020004246) in view of Dimitrov or Vossmeyer. Daniels et al disclose a process for detecting and <u>quantifying</u> one or more analytes (claimed chemical species) in a biological or chemical samples (See P16) comprising exposing a sample comprising a <u>detectable substance</u> to a an organo luminescent semiconductor probe comprising <u>quantum dot</u> (See P81) such as <u>silicon</u> (See P79, last line) using **UV light** (See P82, last line) and a **spectrometer** (See P170). Daniels et al teach that the luminescent semiconductor is capable of exhibiting a detectable change in adsorption (See P120), i.e. the organo luminescent semiconductor of Daniels et al is capable of detecting altered photoluminescence properties of the nanoparticles comprising the chemical adsorbate as a result of the chemical species being adsorbed onto the surface of the nanoparticles, as required by Amendment. Daniels et al teach that the semiconductor nanocrystal may be directly linked to the specific-binding molecule by, for example, covalent chemical bonds, *physical forces* such **van der Waals** (claimed physisorption), for example, nanocrystals can be associated with molecules that bind nonspecifically or sequencespecifically to nucleic acids (e.g., DNA and RNA) (P98). Binding of a detectable substance to a nanocrystal may be via a binding pair, which *typically* bind **non-**

covalently (i.e. claimed physisorption) (See P88). Daniels et al further teach that exposure can be carried out in a **liquid** media (See P259). Daniels et al do not expressly teach that an exposure of the detectable substance to the nanocrystal is carried out in a solid or gas phase (Claims 1, 21).

Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle, e.g. quantum dot, in a **solution** or **solid-phase**, including, for example, to a solid surface such as a chip, microarray or bead (See P13).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Daniels et al in a solid phase since Daniels et al do not limit the exposure to a particular phase and Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle in a solution or solid-phase.

Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a **liquid** or **gas-phase** (See Abstract; column 5, lines 34-45).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Daniels et al in a gas phase since Weiss et al do not limit the exposure to a particular phase and Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a liquid or gas-phase.

Claims 1-3, 5, 6, 8, 10, 11, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chee et al (US 6,544,732) in view of Dimitrov or Vossmeyer.

Chee et al disclose a process for detecting analytes in a biological or chemical samples such as **toxins** (See column 25, lines 47-52) comprising exposing a sample comprising a detectable substance to a semiconductor probe comprising quantum dot (See column 3, lines 54-55) using **UV light** (See column 14, line 59). Chee et al teach that the luminescent semiconductor is capable of exhibiting a detectable change in adsorption (See column 27, lines 45-47), i.e. the luminescent semiconductor of Chee et al is capable of detecting altered photoluminescence properties of the nanoparticles comprising the chemical adsorbate as a result of the chemical species being adsorbed onto the surface of the nanoparticles, as required by Amendment. Chee et al further teach that exposure can be carried out in a **liquid** media (See column 25, lines 36-38). Chee et al do not expressly teach that an exposure of the detectable substance to the nanocrystal is carried out in a solid or gas phase (Claims 1, 21).

Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle, e.g. quantum dot, in a **solution** or **solid-phase**, including, for example, to a solid surface such as a chip, microarray or bead (See P13).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Chee et al in a solid phase since Chee et al do not limit the exposure to a particular phase and Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle in a solution or solid-phase.

Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a **liquid** or **gas-phase** (See Abstract; column 5, lines 34-45).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Chee et al in a gas phase since Chee et al do not limit the exposure to a particular phase and Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a liquid or gas-phase.

Claims 1-3, 5, 6, 8, 10, 11, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Barbera-Guillem et al (US 6,2617,79) in view of Dimitrov or Vossmeyer.

Barbera-Guillem et al disclose a process for detecting analytes in a biological or chemical samples such as **toxins** (See column 3, lines 52-65) comprising exposing a sample comprising a detectable substance (See column 22, lines 1-67) to a semiconductor probe comprising quantum dot (See column 8, lines 33-47) using **UV light** (See column 21, line 58). Barbera-Guillem et al teach that the luminescent semiconductor is capable of exhibiting a detectable change in adsorption (See Abstract), as required by Amendment. Barbera-Guillem et al do not expressly teach that an exposure of the detectable substance to the nanocrystal is carried out in a solid or gas phase (Claims 1, 21).

Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle, e.g. quantum dot, in a **solution** or **solid-phase**, including, for example, to a solid surface such as a chip, microarray or bead (See P13).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Barbera-Guillem et al in a solid phase since Barbera-Guillem et al do not limit the exposure to a particular

phase and Dimitrov teaches that an analyte (a detectable substance) can be attached to a nanoparticle, e.g. quantum dot, in a solution or solid-phase.

Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a **liquid** or **gas-phase** (See Abstract; column 5, lines 34-45).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have carried out an exposure of a detectable substance to a nanocrystal in Barbera-Guillem et al in a gas phase since Barbera-Guillem et al do not limit the exposure to a particular phase and Vossmeyer teaches that adsorption of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a liquid or gas-phase.

Claims 2, 21, 25, 26, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dimitrov in view of Weiss et al or Daniels et al or Chee et al or Barbera-Guillem et al.

Dimitrov are applied here for the same reasons as above. Dimitrov fails to teach that radiation comprises UV (Claim 2); silicon nanoparticles are used instead of CdSe nanoparticles (Claim 21); detecting and analyzing an altered photoluminescence properties comprises utilizing a wavelength selective detector (Claims 25 and 26).

As to claim 2, Weiss et al/Daniels et al/Chee et al/Barbera-Guillem et al teach that UV can be used for as a radiation source for nanocrystals (See above).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used UV as a radiation source for nanocrystals in Dimitrov Weiss et al/Daniels

et al/ Chee et al/Barbera-Guillem et al teach that UV can be used for as a radiation source for nanocrystals.

As to claim 21, Weiss et al teach that either CdSe nanoparticles or silicon nanoparticles can be used for detecting an analyte (See column 5, lines 65; column 6, line 2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used silicon nanoparticles in Dimitrov instead of CdSe nanoparticles since Weiss et al teach that either CdSe nanoparticles or silicon nanoparticles can be used for detecting an analyte.

As to claims 25 and 26, Weiss et al teach that the organo luminescent semiconductor is capable of exhibiting a detectable change in adsorption (See column 2, lines 24-25), i.e. the organo luminescent semiconductor of Weiss is capable of detecting altered photoluminescence properties of the nanoparticles comprising the chemical adsorbate as a result of the chemical species being adsorbed onto the surface of the nanoparticles. The presence of the detectable substance in the material is then determined either by **measuring** the absorption of energy by the organo luminescent semiconductor nanocrystal probe and/or detecting the emission of radiation of a narrow wavelength band by the organo luminescent semiconductor nanocrystal probe and/or detecting the scattering or diffraction by the organo luminescent semiconductor nanocrystal probe, indicative (in either case) of the presence of the organo luminescent semiconductor nanocrystal probe bonded to the detectable substance in the material (See column 3, lines 19-29) obviously utilizing a wavelength selective detector.

Claims 4, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dimitrov in view of Weiss et al (note that in the Final rejection there was a typographical error: Claim 21 should be cited instead of claim 22).

Dimitrov are applied here for the same reasons as above. Dimitrov fails to teach that silicon nanoparticles are used instead of CdSe nanoparticles.

Weiss et al teach that either CdSe nanoparticles or silicon nanoparticles can be used for detecting an analyte (See column 5, lines 65; column 6, line 2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used silicon nanoparticles in Dimitrov instead of CdSe nanoparticles since Weiss et al teach that either CdSe nanoparticles or silicon nanoparticles can be used for detecting an analyte.

Claims 6, 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dimitrov/ Dimitrov in view of Weiss et al/Weiss et al in view of Dimitrov or Vossmeyer/Daniels et al in view of Dimitrov or Vossmeyer, further in view of Chee et al/Barbera-Guillem et al.

Weiss et al/ Daniels et al are applied for the same reasons as above. Weiss et al/ Daniels et al fails to teach that analytes are toxins.

Chee et al/Barbera-Guillem et al are applied for the same reasons as above.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the process of Weiss et al/ Daniels et al for detecting toxins since Chee et al/Barbera-Guillem et al teach that quantum dots can be used for detecting toxins.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Weiss et al in view of Dimitrov or Vossmeyer/Daniels et al in view of Dimitrov or Vossmeyer/Chee et al in view of Dimitrov or Vossmeyer/Barbera-Guillem et al in view of Dimitrov or Vossmeyer, further in view of Harris et al (US 20040009911).

Weiss et al/Daniels et al/Chee et al/Barbera-Guillem et al are applied for the same reasons as above. Weiss et al/Daniels et al/Chee et al/Barbera-Guillem et al fail to teach that adsorption of chemical species is reversible process.

Harris et al teach that quantum dots can be used in reversible processes (See P8, 16, 156, 161).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used quantum dots of Weiss et al/Daniels et al/Chee et al/Barbera-Guillem et al in reversible processes, as taught by Harris et al.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Weiss et al in view of Dimitrov or Vossmeyer/Daniels et al in view of Dimitrov or Vossmeyer/Chee et al in view of Dimitrov or Vossmeyer/Barbera-Guillem et al in view of Dimitrov or Vossmeyer, further in view of West et al (US 6,530,944).

Weiss et al/Daniels et al/Chee et al/Barbera-Guillem et al are applied for the same reasons as above. Weiss et al/Daniels et al/Chee et al/Barbera-Guillem et al fail to teach that the nanoparticles are present in aerosol.

West et al teach that the nanoparticles can be delivered in aerosol (See column 16, lines 5-8).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used aerosol form to deliver nanoparticles in Weiss et al/Daniels et al/Chee et al/Barbera-Guillem et al since West et al teach that the nanoparticles can be delivered in aerosol.

Claims 12, 13, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weiss et al in view of Dimitrov or Vossmeyer/Chee et al in view of Dimitrov or Vossmeyer/Barbera-Guillem et al in view of Dimitrov or Vossmeyer, further in view of Daniels et al.

Weiss et al/Chee et al/Barbera-Guillem et al are applied for the same reasons as above. Weiss et al/Chee et al/Barbera-Guillem et al fail to teach that fail to teach that detecting and analyzing the altered photoluminescence properties comprises utilizing a spectrometer (Claim 12) or optical filter (Claim 13); photoluminescence properties can be for quantitating analytes (Claim 15).

Daniels et al, as applied above, teach that a spectrometer or filters can used for detecting photoluminescence properties (See P170) and photoluminescence properties can be for quantitating analytes (See P16).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized a spectrometer or optical filter in Weiss et al/Chee et al/Barbera-Guillem et al for detecting and analyzing the altered photoluminescence properties since Daniels et al teach that a spectrometer or filters can used for detecting photoluminescence properties.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized detecting and analyzing the altered photoluminescence properties in

Weiss et al/Chee et al/Barbera-Guillem et al for quantitating analytes since Daniels et al teach that photoluminescence properties can be for quantitating analytes.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Weiss et al in view of Dimitrov or Vossmeyer/Daniels et al in view of Dimitrov or Vossmeyer/Chee et al in view of Dimitrov or Vossmeyer/Barbera-Guillem et al in view of Dimitrov or Vossmeyer, further in view of Ravkin et al (US 6,908,737).

Weiss et al/Daniels et al/Chee et al/Barbera-Guillem et al are applied for the same reasons as above. Weiss et al/Daniels et al/Chee et al/Barbera-Guillem et al fail to teach that fail to teach that detecting and analyzing the altered photoluminescence properties comprises utilizing an optical filter.

Ravkin et al teach that fluorescent emissions are <u>usually</u> distinguished by optically filtering with band pass, or combination of long and short pass, filters (See column 28, lines 18-25).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized optical filter in Weiss et al/Daniels et al/Chee et al/Barbera-Guillem et al for detecting and analyzing the altered photoluminescence properties since Ravkin et al teach that fluorescent emissions are <u>usually</u> distinguished by optically filtering with band pass, or combination of long and short pass, filters.

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dimitrov/ Dimitrov in view of Weiss et al/Weiss et al in view of Dimitrov or Vossmeyer/Daniels et al in view of Dimitrov or Vossmeyer, further in view of Harris et al.

The cited prior art is applied here for the same reasons above. The cited prior art fails to teach that adsorption of chemical species is reversible process.

Harris et al teach that quantum dots can be used in reversible processes (See P8, 16, 156, 161).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used quantum dots of the cited prior art in reversible processes, as taught by Harris et al.

Claims 25-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dimitrov in view of Weiss et al/Weiss et al in view of Dimitrov or Vossmeyer, further in view of Daniels et al.

The cited prior art is applied here for the same reasons above. The cited prior art fails to teach that detecting and analyzing the altered photoluminescence properties comprises utilizing a spectrometer (Claim 27) or optical filter (Claim 28); photoluminescence properties can be for quantitating analytes (Claim 29).

Daniels et al, as applied above, teach that a spectrometer or filters can used for detecting photoluminescence properties (See P170) and photoluminescence properties can be for quantitating analytes (See P16).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized a spectrometer or optical filter in Weiss et al for detecting and

analyzing the altered photoluminescence properties since Daniels et al teach that a spectrometer or filters can used for detecting photoluminescence properties.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized detecting and analyzing the altered photoluminescence properties in Weiss et al/Chee et al/Barbera-Guillem et al for quantitating analytes since Daniels et al teach that photoluminescence properties can be for quantitating analytes.

Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dimitrov/ Dimitrov in view of Weiss et al/Weiss et al/Daniels et al in view of Ravkin et al.

The cited prior art is applied here for the same reasons above. The cited prior art fails to teach that fail to teach that detecting and analyzing the altered photoluminescence properties comprises utilizing an optical filter.

Ravkin et al teach that fluorescent emissions are <u>usually</u> distinguished by optically filtering with band pass, or combination of long and short pass, filters (See column 28, lines 18-25).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized optical filter in Weiss et al/Daniels et al for detecting and analyzing the altered photoluminescence properties since Ravkin et al teach that fluorescent emissions are <u>usually</u> distinguished by optically filtering with band pass, or combination of long and short pass, filters.

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dimitrov/ Dimitrov in view of Weiss et al/Weiss et al in view of Dimitrov or Vossmeyer/Daniels et al in view of Dimitrov or Vossmeyer, further in view of West et al.

The cited prior art is applied here for the same reasons above. The cited prior art fails to teach that the nanoparticles are present in aerosol.

West et al teach that the nanoparticles can be delivered in aerosol (See column 16, lines 5-8).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used aerosol form to deliver nanoparticles in Weiss et al/Daniels et al/Chee et al/Barbera-Guillem et al since West et al teach that the nanoparticles can be delivered in aerosol.
Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dimitrov/ Dimitrov in view of Weiss et al/Weiss et al in view of Dimitrov or Vossmeyer/Daniels et al in view of Dimitrov or Vossmeyer, further in view of Chee et al.

The cited prior art is applied here for the same reasons above. The cited prior art fails to teach that the nanoparticles are present in the gas phase.

Chee et al teach that luminescent sensors can be used for detecting specific substances in gases (See column 1, lines 10-13, 25-30; column 2, lines 59-64).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used luminescent sensors of Weiss et al/Daniels et al for detecting specific substances in gases since Chee et al teach that luminescent sensors can be used for detecting specific substances in gases.

(10) Response to Argument

Applicants' arguments filed February 27, 2007 have been fully considered but they are not persuasive.

(1) Applicants argue that Dimitrov does not teach or suggest physisorbing an analyte species directly on a nanoparticle, nor does Dimitrov teach or suggest detecting changes in the photoluminescence of the nanoparticle as a result of physisorbing an anatyte onto its surface—as required by Claim 1.

The Examiner disagrees.

(i) The transitional term "comprising" is inclusive or open-ended and **does not exclude** additional, unrecited elements or method steps. See MPEP 2111.03 [R-3]. Therefore, the method of Claim 1 is open-ended and **does not exclude** additional, unrecited method steps such as *chemisorption* step. As was discussed above, in a process of forming a *chemical* adsorbate, a chemical reaction between the chemical species and substrate surface does not occur immediately, the chemical species has to be *physisorbed* onto the subsrate surface to let the reaction to occur. Therefore, *physisorption* of a chemical species onto the surface of nanoparticles is a first *necessary* step before being *chemically* adsorbed onto the surface of the nanoparticles, as evidenced by US 6,778,165 to Hubby, Jr. et al showing that the species are first **physisorbed** on the substrate and then mildly heated to produce the sulfur-gold bond, with the chemisorbed species being more tightly bound than the physisorbed species (See column 4, lines 1-7) and US 5,457,073 to Ouellet showing that water vapour is first physically absorbed by SOG and is continuously and slowly chemically absorbed; the longer the SOG film exposure to ambient air, the more water vapour is chemically absorbed (See column 7, lines 37-64).

(ii) As to detecting changes in photoluminescence, Dimitrov teaches that the term "label" is intended to mean a molecule or molecules that render an analyte detectable by an analytical method (P20); nanoparticles such as quantum dots (e.g. CdS) also can be used as label monomers to label nucleic acids (P38); quantum dots are ***fluorescing*** crystals that are excitable upon **irradiation** with white light (P40), with a wavelength **dependent on their chemical composition** and size. (P40); label has a *detectable signal* that distinguishes it from other labels in the same mixture (P21); the term "signal" is intended to mean a detectable, physical quantity or impulse by which information on the presence of an analyte can be determined, and includes, for example, ***fluorescence***, luminescence (P22). In other words, **Dimitrov teaches that quantum dots that *fluoresce* upon *irradiation* with white *light* (claimed photoluminescence) can be used as *labels* that emit detectable *signal, i.e.* a detectable, physical quantity or impulse by which information on the presence of an analyte can be determined.**

Note that claim 1 does not recite a negative limitation of analyte not being chemically adsorbed.

(iii) Applicants argue that Dimitrov does not anticipate the claims because Dimitrov does not show solid-phase examples.

The argument is unconvincing because it is held that patents are relevant as prior art for all they contain. See Celeritas Technologies Ltd. v. Rockwell International Corp., 150 F.3d 1354, 1361, 47 USPQ2d 1516, 1522-23 (Fed. Cir. 1998) (The court held that the prior art anticipated the claims even though it taught away from the claimed invention. "The fact that a modem with a single carrier data signal is shown to be less than optimal does not vitiate the fact that it is disclosed."). NONPREFERRED EMBODIMENTS CONSTI-TUTE PRIOR ART. Disclosed

<u>examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments</u>. See MPEP 2123.

(iv) In the Final rejection in support of 102 rejection, the Examiner cites a patent to Hubby and a patent to Ouellet in support of assertion that physisorption is a first necessary step. Applicants traverse 102 rejection of improper multiple references.

First of all, the Examiner cites a patent to Hubby and a patent to Ouellet not in 102 rejection but in Remarks while responding to Applicants arguments. Secondly, It is well settled that a 35 U.S.C. 102 rejection over multiple references has been held to be proper when the extra references are cited to: (A) Prove the primary reference contains an "enabled disclosure; " (B) Explain the meaning of a term used in the primary reference; or (C) Show that a characteristic not disclosed in the reference is inherent. See MPEP 2131.01. Thus even if the Examiner used a patent to Hubby and a patent to Ouellet in 102 rejection, it would be a proper 102 rejection because they are applied to show that a characteristic not disclosed in the reference (physisorption) is inherent.

(2) (i) Applicants argue that Weiss et al do not teach physisorption.

The argument is unconvincing because Weiss et al teach that the adherence of a detectable substance to a nanocrystal may comprise **any** sort of bond, including, **<u>Van der Waals' forces</u> (claimed physisorption)**, or **<u>mechanical bonding</u> (claimed physisorption)** (See column 5, lines 41-46).

(ii) Dimitrov teaches only chemosorption. No combination of Weiss and Dimitrov teaches physisorption. The argument is unconvincing because Dimitrov is a secondary reference

which is relied upon to show that an analyte (a detectable substance) can be attached to a nanoparticle, e.g. quantum dot, in a **solution** or **solid-phase**, including, for example, to a solid surface such as a chip, microarray or bead (See P13). Since Weiss et al teach that the a detectable substance may be attached to a nanocrystal by covalent bond (chemisorption), one of ordinary skill in the art would have reasonable expectation of success in chemically attaching analyte in a **solution** or **solid-phase.** It is held that rationale different from applicant is permissible. The reason or motivation to modify the reference may often suggest what the inventor has done, but for a *different purpose or to solve a different problem*. It is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by applicant. In re Linter, 458 F.2d 1013, 173 USPQ 560 (CCPA 1972) (discussed below); In re Dillon, 919 F.2d 688, 16 USPQ2d 1897 (Fed. Cir. 1990), cert. denied, 500 U.S. 904 (1991) (discussed below).

(iii) Applicants argue that Vossmeyer teaches an electronic sensor not one based on photoluminescence.

However, Vossmeyer is a secondary reference which is relied upon to show that **adsorption** of an analyte (a detectable substance) to a nanoparticle of 20 nm or less (See column 3, lines 36-40) may be carried out in a liquid or gas-phase (See Abstract; column 5, lines 34-45). Therefore, it is irrelevant whether an electronic sensor based or not on photoluminescence.

(3) Applicants argue that Daniels et al do not teach claimed invention because Daniels et al require a targeting compound *bound* to the nanocrystals and thus, the analyte is not in direct contact with nanocrystals.

The Examiner respectfully disagrees with this argument. First of all, it is noted that the features upon which applicant relies (i.e., direct contact) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Secondly, the claims do not recite negative limitation of non-binding.

(4) Applicants argue that in Chee et al nanocrystals do not interact directly to biomolecules.

The Examiner respectfully disagrees with this argument because the claims do not recite "direct interaction".

(5) Applicants argue that in Barbera-Guillem et al nanocrystals do not interact directly to biomolecules.

The Examiner respectfully disagrees with this argument because the claims do not recite "direct interaction".

(6-17) Applicants argue that rejection over cited prior art is non-obvious for the same reasons as above.

The Examiner respectfully disagrees with this argument for the same reasons as above.

(16) Applicants argue that in addition West is not combinable with cited prior art considering dissimar nature of the arts involved.

The argument is unconvincing because West et al teach that the nanoparticles can be delivered in aerosol (See column 16, lines 5-8) for **diagnostic** purposes (See Abstract). Thus all cited art is in the same field of recognizing analyte (a detectable substance).

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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May 16, 2007

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